a wise publicity the worth of its goods, sometimes excellent, but sometimes also copies of our models and inferior to ours; their catalogues, well edited and illustrated, are published in many languages, and give full details of the instruments they describe, their travellers, men of parts, knowing intimately their instruments . . . and trying to satisfy the wishes of their customers."

M. Boutaric points out that the collaboration between the man of science and the manufacturer is far more close in Germany than in France. In the former the man of science is in intimate touch with the works, and is well paid for his services. The foreman and apprentices are trained in the theoretical side of their subject in classes they are obliged to attend. In the firm of Zeiss half the time spent by the workers in the technical classes is counted as time spent in the works. No steps are neglected to perfect the organisation as a whole; everything is done to make the machine independent of a single individual. In France the success and reputation of a firm have too frequently depended on one individual. That some steps are being taken to strengthen the optical industry in France is shown by the fact that a large factory has been built by La Société française d'Optique, formed in conjunction with the firm of Lacour-Berthiot, for meeting the competition of the best German firms. M. Boutaric urges that if the future of the industry is to be assured, new blood must be introduced, young mechanics trained, and a school of optics founded. This school, for which M. Violle has pleaded, should be divided into at least two sections: optics proper and photography. In it practical classes on glass grinding, etc., should be given in conjunction with theoretical work.

After an appeal for mutual co-operation between the various firms and individuals interested, M. Boutaric urges that the Government should take steps to protect French patents and trade marks against unfair competition. Anyone with experience of the laxity of the French patent specification and patent laws will appreciate the force of this appeal.

ARCTIC OCEANOGRAPHY.

IMPORTANT contributions to Arctic oceanography are contained in the report of Dr. F. Nansen's work in Spitsbergen seas in 1912 ("Spitsbergen Waters." By F. Nansen. Christiania, 1915). Dr. Nansen spent July and August of that year in his yacht, the *Veslemöy*, on the west and north of Spitsbergen. His main object was to push far to the north to get deep-water samples from the polar basin in order to make more accurate determinations of specific gravity than were possible during the voyage of the *Fram*. But this aspect of the expedition was only partially successful on account of the pack ice being unusually far south. However, a great deal of valuable work was done, both in the open seas and in the fjords. Only one or two of many interesting results can be noticed here.

It has been maintained that the melting of glacier ice has a considerable cooling effect on the water strata of Spitsbergen fjords. Dr. Nansen confutes this idea. He took a vertical series of temperatures at the entrance to Ice Fjord in July, when it was clear of ice, and again in August, when ice almost blocked the way. The water at 50 metres and the intermediate cold layer were much warmer in August than in July. Again, in Cross Bay, at both 100 and 200 metres from the face of Lillehook Glacier, the cold intermediate layer was both thinner and warmer than further out in the fjord. The bottom temperatures near the glacier were also higher than further out in the fjord. But as the surface salinity was greater near the glacier than further away it would appear that the glacier ice does not melt rapidly at the upper end of the fjord. The high salinities of the inner end of the fjord may be in part due to the more extensive formation of ice in winter there than further out, which would increase the salinity.

Another important matter raised in this paper is the extension and shape of the north polar basin. In this matter Dr. Nansen has modified his views since the days of his *Fram* expedition. The result of that expedition led to the belief that the water of the north polar basin differed from that of the Norwegian Sea. The work of the *Veslemöy* contradicts this, and shows that the salinities of the two are identical. The deep water of the north polar basin is probably derived from the Norwegian Sea. This discovery does away with the necessity for postulating a high submarine ridge between Greenland and Spitsbergen, yet one at a depth of about 1200–1500 metres is still necessary to account for the difference in temperature of the deep water in the two basins. In any case, if the deep water of the polar basin is derived from the Norwegian Sea and not formed in the basin itself, there is no need to believe in such an extensive polar basin as formerly was considered necessary. The discovery, a few years ago, by Vilkitski, of islands north of Cape Chelyuskin does something to confirm this belief in a less extensive deep basin. It is true that the Stefansson expedition found no new land, and that Peary's Crocker Land has apparently no existence, but these facts do not disprove the possibility of a wide continental shelf, and Nansen goes at considerable length into questions of the drift of the *Fram* and of the ice to substantiate the probability of this being the case. We have followed Nansen in using the form Norwegian Sea, but there seems to be no reason why this should replace the older and generally accepted name, Greenland Sea.

NOTES.

DR. J. O. BACKLUND, M. B. Baillaud, Sir F. W. Dyson, Dr. P. Lowell, Prof. F. Schlesinger, and Prof. H. H. Turner have been elected honorary fellows of the Royal Astronomical Society of Canada.

THE provisions of the "Summer Time" Act will cease to operate at the end of September. In a written answer to an inquiry raised by a member of Parliament the Home Secretary said:—"The three hours following midnight (Summer Time) of the night of September 30–October 1 are included in the Summer Time period. The change does not take place until 3 a.m. Summer Time, or 2 a.m. Greenwich Time, on October 1. At that hour the clocks will be put back one hour, so that the period 2–3 a.m. Summer Time will be followed by a period 2–3 a.m. Greenwich Time, and they can readily be distinguished by the addition of the words 'Summer Time' or 'Greenwich Time,' as the case may be."

We announce with much regret the death, on August 20, at the age of fifty years, of Dr. T. Gregor Brodie, professor of physiology in the University of Toronto.

The *Times* for August 11 contains a notice of the death in action of a very promising young geologist, Eric Warr Simmons, who was gazetted 2nd Lieut. in the 6th York and Lanc. Regiment in January, 1915. He took part in the landing at Suvla Bay, and was reported missing on August 11, 1915. He studied geology at University College, London, gaining several prizes and a university scholarship, and graduated with first class honours in 1914. He was a student-demonstrator in the geological department of University College. He was an enthusiastic member of the University O.T.C., and immediately after taking his degree applied for, and obtained, a commission. He had no time, therefore, for completing any original research. He was elected a fellow of the Geological Society in 1915. His death adds another name to the list of the younger generation of scientific men from whom much was expected who have perished in the war.

The death is announced, in his sixty-fourth year, of Mr. C. W. H. Kirchhoff, one of the leading American authorities on metallurgy and allied subjects. A native of San Francisco, he graduated at the Royal School of Mines, Clausthal, Germany, in 1874, as mining engineer and metallurgist. Returning to America, he served for three years as chemist of a lead refinery in Philadelphia, and then joined the staff of the *Metallurgical Review*. His principal work in technical journalism was done in connection with the *Iron Age*, of which he was associate editor from 1884 to 1889 and editor-in-chief from 1889 to 1910. From 1883 to 1906 he was a special agent of the U.S. Geological Survey for the collection of statistics on the production of lead, copper, and zinc. He was elected president of the American Institute of Mining Engineers in 1898 and again in 1912. In 1910 he published "Notes on Some European Iron Districts."

The sixty-first annual exhibition of the Royal Photographic Society opened last Monday at the Suffolk Street Galleries, and it is surprising to see how little effect the war has had upon the number and the interest of the exhibits. The chief, if not the only reminder of the crisis is a series of three official war photographs, panoramas made by the Printing Company of the Royal Engineers. They are enlargements of two diameters from 5×4 negatives, taken with telephotographic lenses (30 in. and 72 in. equivalent focal lengths) on panchromatic plates and with dense colour screens. They show the trenches. Each consists of several prints joined to form a continuous picture, and the quality of the work leaves, practically speaking, nothing to be desired. Among the photomicrographs is a fine series of sixty by Mr. G. Ardaseer of the Radulæ of Mollusca from specimens lent by the Rev. Prof. H. M. Gwatkin, Mr. E. A. Pinchin sends a series of Naviculæ, photographs of diatoms of a quality that has never been surpassed and rarely equalled, and Dr. G. H. Rodman's macroscopic and microscopic examples of the flora and fauna remains found in Coal Measures, from specimens in the Natural History Museum, form an extensive and very valuable series. Among the astronomical photographs, the most remarkable are by Dr. R. W. Wood of Saturn and Jupiter taken at Mount Wilson by the 60-in. reflector. Each planet is photographed by means of infra-red, yellow, violet, and ultra-violet light, and the differences are demonstrated by various combinations of these in different colours. Of the many other exhibits we have only space to refer to Mr. J. H. Gardiner's auto-radiographs of radium-bearing minerals, which clearly show the radium-bearing parts of each specimen, and Miss M. O. Edis's photographs of Sir James Dewar's 17-in. soap bubble taken during the first, second, and third weeks of its life, the last quite black and very near to the limit of thinness.

An increased prevalence of acute poliomyelitis (infectious or infantile paralysis) is reported in New York and in Aberdeen. The somewhat alarmist notices on the subject in the daily Press are scarcely warranted at present, as the actual number of cases notified does not appear to be large in either case—forty-eight in the former and thirty-nine in the latter. But the disease is most prevalent in July, August, and September, so that the occurrence of further cases is likely. As regards the British Isles, the population in general, and adults in particular, seem to be relatively insusceptible. The early recognition and isolation of the first cases are important, for all the available evidence points to the transmission of the disease by direct contact with acute cases or carriers, and not by flies or vermin. The secretion from the nose or mouth nearly always seems to be the source of infection. The virus is easily destroyed by dilute solutions of disinfectants, and does not appear to be capable of survival for more than a very short period outside the human body.

The American Museum has recently selected from its large collections a special exhibit of moccasins illustrating the principal patterns and their decoration, as well as the relation between the style of decoration and the structure. The true moccasin is almost confined to Canada and the northern two-thirds of the United States. So far as the data from the museum collections, described by Mr. C. Wissler in the *American Museum Journal* for May, indicate, it does not occur in Mexico or South America, but it extends to Siberia and Lapland. Though the types used by American Indians seem to be infinitely varied, they possess a few common structural features. As regards material, reindeer skin is used in the Old World and caribou in the New, two closely allied species. It thus turns out that the skin shoe is the correlate of the reindeer culture, a fact of interest to the ethnographer. As regards decoration, the styles were at the outset correlates of the structural pattern, serving at first some useful purpose; but when once they were established as styles they were carried over to footwear of other kinds where they serve no practical purpose.

The designer of art fabrics, who is always in search of new sources of inspiration, may well direct his attention to the article on the decorative value of Indian art, by Miss E. A. Coster, in the May issue of the *American Museum Journal*. The patterns in Indian weaving have not the variety shown in Persian and Italian textiles, but possess strength, simplicity, and fine proportion. For the worker in ceramics there are unbounded possibilities, both in shapes and decorations. In metal-working the rosette type of decoration will be especially helpful. The author rightly observes :—"In adapting Indian motives the primitive spirit must be retained or the result will be a disappointment; but a reversion to the simplicity and free expression of Indian art is what modern craftsmen most need to counteract the tendency to over-decoration, mechanical technique, and lack of individuality."

The question of the origin of the dolmen is a subject of active controversy into which we have at present no desire to enter. But for the benefit of those who are interested in the problem we may note the latest theory presented by Mr. Harold Peake in the August issue of *Man*. He suggests that prior to 2200 B.C. some traders from the north of the Ægean, familiar with the use of copper, and probably possessing the secret of bronze-making, set out from their home, which may have been Lemnos, in search of copper and tin. He notes in this connection the cult of the Dactyls or Cabiri, mysterious divine or heroic beings, at some centre in the south-east Ægean, and of Hephaistos at Lemnos, both connected with metal-working. These traders were also in touch with the Morbihan, possibly through the mediation of western merchants engaged in commerce on the Atlantic seaboard. At home they may have had relations with Crete, the Cyclades, and Hissarlik, and through the last with Cyprus. They were accustomed to erect Cyclopean walls, and learnt the use of cists from the people of the Cyclades. This combined knowledge they carried with them to the western people with whom they traded. The result was the evolution of the dolmen as we find it in the western Mediterranean and along the Atlantic seaboard.

The *Zoologist* for July contains a most interesting account of the prevalent beliefs concerning animals, their uses, and the *rôle* they play in the mythology of South India, by Prof. Rae Sherriffs. At first sight this contribution might seem to represent no more than a collection of curious beliefs, founded for the most part on very slender knowledge. More closely examined, it will be found to afford a valuable insight into the habit of mind of the less educated portion of the population, which should be thoroughly understood by all Europeans who are engaged in administrative work in India. Having regard to the fact that there is still a great mortality from snake-bite in India, it is strange that the people as a rule have not acquired a more exact knowledge of these scourges. But the belief is still common that the cobra, the best-known snake of India and widely worshipped, is the female, and the rat-snake the male, of a common species. We look forward to the promised continuation of this theme.

Under the title of "The Free-living Nematodes of the Gulf of Sevastopol" an important monograph by I. Filipjev has recently been published in the Proceedings of the Sevastopol Biological Station and of the Zoological Laboratory of the Imp. Acad. Sci., Petrograd. This work is of special interest in that it gives for the first time a description of the Nematode fauna of the Black Sea, a group of Vermidea which presents great difficulties from a systematic point of view, and has therefore been less investigated than other groups of Vermidea. Filipjev's work is in three parts :—(1) Systematic, including the description of about a hundred species of Nematodes, of which some eighty are new, and a few new genera. (2) Morphological, containing many new anatomical data. (3) General, giving the topographical distribution and synoptical tables of genera and species.

Report No. 108 of the U.S. Department of Agriculture consists of an admirable summary by Nathan Banks of the Acarina or mites "for the use of economic entomologists." This booklet of 153 pages contains a general introduction to the structure and life-history of mites and a synopsis of the families and principal genera of the order, illustrated by nearly 300 figures, and concluding with a bibliography and index. Though primarily intended for use in America, Mr. Banks's work cannot fail to be of service to British students who, not having special knowledge of the Acarina, are called on to classify members of this difficult order. Under the heading "Uncertain Acari" reference is made to the Linguatulida and the Tardigrada; it is somewhat surprising to find the Pycnogonida—which are surely further from mites than any other order referable to the Arachnida—in the same assemblage.

The current number of the *Quarterly Journal of Experimental Physiology* contains a long and valuable paper by Dr. E. G. Boring on the return of sensation after the division of cutaneous nerves. The author lays great stress on the importance of statistical methods and of the standardisation of the experimental conditions in investigations of this nature. He further points out that the analysis of the nature of the cutaneous sensations, as they return during regeneration of a divided nerve, calls for psychological as well as physiological training. As a result of his own observations, the author has failed to confirm some of Head's observations, and he entirely disagrees with the hypothesis of the existence of "protopathic" and "epicritic" sensibility which was advanced by Head and his co-workers. Dr. Boring considers that the results are best explained on the assumption that single sensory spots are innervated by more than one nerve-fibre and that the multiple innervation is projected upon the central nervous system as multiple excitations; he concludes that the sensory phenomena occurring during the return of cutaneous sensation can be accounted for on this hypothesis.

In the *Psychological Review* (vol. xxiii., No. 4) Harvey Carr revives the problem of cutaneous sensitivity, as formulated by Rivers and Head in their well-known article of some years ago entitled "A Human Experiment in Nerve Division." The writer challenges the correctness of Head's theory, both from the point of view of the facts and of the interpretation of those facts. The nerve section, he maintains, produced an extremely abnormal condition of the cutaneous tissues, so that peculiarities of sensitivity were to be expected; hence it is not surprising that other investigators have failed to discover what Head calls the protopathic sensibility mediating four functions, and the epicritic mediating three. So far they have only been able to get evidence of the four sensory functions as formulated by earlier writers. Even, however, granting Head's evidence, Harvey Carr submits that the facts do not bear out the interpretation put upon them. He thinks that there is a too general tendency to accept enthusiastically and uncritically Head's theory. The article will prove interesting to many men of science, but particularly to physiologists and psychologists.

In the Proceedings of the Physiological Society for July, Dr. Edridge-Green records the subjective phenomena produced by gazing steadily with one eye at a rotating cylinder of paper, half of which is black and half white. He finds that the centre of the field of vision appears to be in violent motion of a whirlpool character, and that the white part of the cylinder may appear green or rose-coloured according to the rate at which it is rotated. Dr. Edridge-Green explains these phenomena by supposing that the rods have the function of supplying visual purple to the cones, and thus increasing the sensitiveness of the latter to the light. The movement seen on gazing at the rotating cylinder is due to currents of photo-chemical liquid (visual purple) flowing towards the fovea in order to sensitise it.

IN Memoirs of the Geological Survey of New South Wales, Ethnological Series, No. 2, Mr. Etheridge, curator of the Australian Museum, Sydney, discusses the remarkable cylindro-conical and cornute stones found in the valley of the Darling. All kinds of explanations of their use have been given, some utilitarian, as, for instance, that they were employed as grinders, tombstones, records of the dead, challenge stones, or *bora* message stones; others magical, as used in rain-making and snake-producing, as death bone pointers, and so on. On the whole, it seems clear that they were used by the aborigines for some magical purpose, which may have varied among the different groups which possessed them. But the balance of evidence indicates that they were of a phallic type, and that they were used in some form of fertility rites.

CALCIUM carbonate in its crystalline forms gains further interest from a paper by Messrs. J. Johnston, H. E. Merwin, and E. D. Williamson (*Amer. Journ. Sci.*, vol. xli., 1916, p. 473). It is shown that the presence of calcium sulphate determines the precipitation of aragonite, a small quantity of the sulphate becoming associated in solid solution in the crystals. Aragonite has been thus obtained at as low a temperature as 19°. A form styled $\mu-\mathrm{CaCO_3}$, in scales and hexagonal plates, has been obtained under conditions which are not fully determined. It has refractive indices between 1·550 and 1·650, a density of 2·54, and is unstable in the presence of nuclei of calcite or aragonite, which are less soluble. This form behaves like aragonite with Meigen's test. Useful warnings are given as to the use of this test in the case of mixed materials. Calcium carbonate hexahydrate ($\mathrm{CaCO_3.6H_2O}$) is precipitated as monoclinic crystals at temperatures below about 20°; it can be preserved for months in isolated crystals in clove oil as a microscope preparation, but it changes rapidly at ordinary room temperature into calcite and water. The natural forms are carefully considered, and it is suggested that the preservation of aragonite in any but recent geological formations may depend upon its having been kept dry. It may be mentioned that this agrees with the observations of Horwood, Cole, and Little, who show that geologically old aragonite shells are preserved in clays rather than in limestones.

"THE Data of Geochemistry," by Mr. F. W. Clarke (U.S. Geological Survey, Bull. 616, 1916) now appears in its third edition, enlarged by some forty pages. The guarded discussion of Brun's results on volcanic gases in the edition of 1911 here receives important modifications; additional references are given to the problems of radio-activity; and even in the treatment of the deposition of carbonates by organisms new observations have been noted. It is remarkable how this book, embodying an enormous range of facts, and without a single illustration, retains its philosophic character and is readable throughout. We turn to it from the ordinary manual of petrography as we might turn from a stained-glass window to a conference with the cathedral founders.

THE peridotite with rhombic pyroxene that traverses gneiss in the Sierra de Ronda in Malaya proves to be the source of platinum in the sandy alluvium of the streams. This occurrence is contrasted by MM. L. Duparc and A. Grosset (*Mém. Soc. de physique et d'hist. nat. de Genève*, vol. xxxviii, 1916, p. 253) with the platiniferous dunite of Tagilsk in the Urals; the parent rock and its products of weathering are shown to resemble far more closely those of Khrebet Salatim, which lie farther north on the east flank of the Urals, and were discovered by M. Duparc in 1907. Maps are given of these three localities; the numerous small landscapes from the Ronda district have no great geological interest.

A VERY interesting and important paper by P. H. Gallé on the relation between fluctuations in the strength of the trade winds of the North Atlantic Ocean in summer and departures from the normal of the winter temperature in Europe appears in a recent issue of the Proceedings of the Amsterdam Royal Academy of Sciences. In a previous paper the author had shown that variations in the strength of the trade winds (15°–25° N., long. 25°–45° W.) were apparent two or three months later in some hydrographical phenomena in northern Europe. The subsequent variations in winter temperature have now been investigated. From an exhaustive comparison of various groups of months for the period 1899–1914 for combinations of five Dutch stations, three German stations, and three in the Far North-west, it was found that the largest correlation was obtained between the fluctuations of the trade wind for the six months May to October on one hand, and those in the temperature for the three winter months December to February following, on the other. The results, based on values computed for 135 stations, are graphically shown by iso-correlational lines on two charts which apply to the trade winds of May to October and of June to November respectively. For the first period the maximum positive value of r, 0·70, is obtained in East Germany, the largest negative, 0·60, in North Iceland and East Greenland. The largest correlation factor for any period was found in that part of Germany embracing the stations Berlin, Görlitz, Posen, and Ratibor, where the relation between the strength of the trade winds over the months June to November and the following winter temperature gave $r=0{\cdot}85$ and $f=0{\cdot}04$. By this method a successful prediction was made of the temperature over north-western Europe last winter.

THE Meteorological Office has issued a chart dealing with temperature scales which is evidently intended for the use of meteorological observers, but might with great advantage be suspended in every physical laboratory in the country. On the left-hand side of the chart the absolute, the Centigrade, and the Fahrenheit scales of temperature are drawn alongside each other from the absolute zero to 1500° A. of the absolute scale, the divisions being at 10° intervals on the absolute and Centigrade, and at 20° intervals on the Fahrenheit scale. A number of important thermometric points are indicated on the absolute scale, *e.g.* 4° A. helium boils; 43° A. oxygen melts; 90° A. oxygen boils; 234° A. mercury melts; 372·65° A. water boils under one-bar pressure; 505° A. tin melts; 717° A. sulphur boils; 800° A. bodies just red-hot, etc. On the right-hand side of the chart the three scales, from 180° to 330° on the absolute scale, are drawn together, the divisions on the absolute and Centigrade scales being one, and those on the Fahrenheit scale two degrees apart. A number of important meteorological temperatures are indicated—*e.g.* 219° A. the mean temperature of the stratosphere over England, 246° A. the lowest, and 311° A. the highest, temperature observed in the British Isles, etc. The strength of the solar heat stream is given as 135 milliwatts per sq. cm., but there is no indication as to where it has this particular strength.

IN the *Times Trade Supplement* for August Prof. H. E. Armstrong strongly urges that, without delay, concerted action should be taken for the complete association and organisation of all the interests connected with the manufacture of dye-stuffs. He argues that the Government has failed to appreciate the requirements of the situation, and has antagonised the interests concerned, and advocates the provision, in place of the body now ruling British Dyes, Ltd., which is described as incompetent, of a satisfactory joint management on which the fine chemical industry shall also be represented. Prof. Armstrong points out that five-sixths of the coal raised in this country is used direct, whilst the valuable volatile matters are conserved only from the remaining sixth. If the whole of the raw bituminous coal were coked at suitable temperatures, large quantities of liquid fuel suitable for use in internal combustion engines would be obtained; there would be a more than sufficient supply of the raw materials necessary for the manufacture of modern high explosives; the raw material for dyes would be more than enough to supply the whole world; large quantities of ammonia would be available for agricultural use; the volume of high-grade gas produced would be more than sufficient for domestic use; and by using the resulting soft coke the open fire could be retained with the advantage that soot and smoke would be abolished and less acid sent into the atmosphere. It has been stated that since the war began ten or more works for the carbonisation of coal at low temperatures (designed on the experience gained from experiments carried out in *this* country) have been erected in Germany, whilst our works are still in the course of erection. Prof. Armstrong urges that the Government should legislate forbidding the use of raw coal, and endorses the suggestion of the President of the Society of Chemical Industry that only the export of coke, not that of raw bituminous coal, should be allowed. Legislation is also necessary for the provision of funds for the study of all problems relating to the development of coking processes, the efficient use of fuels, and the utilisation of by-products. More than 600,000*l*. could be obtained annually for this purpose by placing a tax of only one halfpenny on each ton of coal raised. Not only would all the industries dependent on coal as a basis be developed as a result of such legislation, but our universities would be stimulated in the production of highly trained scientific workers, for whom there would then be a considerable demand.

CIRCULAR No. 19, issued by the Bureau of Standards, United States Department of Commerce, consists chiefly of a collection of standard density and volumetric tables issued in connection with the use of the hydrometer for industrial purposes or for the assessment of revenue duties. The confusion which had resulted from the employment of insufficiently defined hydrometer scales, and the lack of a uniform basis for the verification of standards, led the Bureau to investigate the problems connected with hydrometry, and to prepare standard density tables which would serve the purposes of accurate definition. The tables are set out clearly, so that there is no ambiguity as to their meaning or as to the bases on which the calculations are founded. In addition to the main particulars referring to aqueous solutions of ethyl and methyl alcohols, sulphuric acid, and cane sugar, various auxiliary tables are given, including temperature corrections, Baumé equivalents, and reduction of weighings in air to the corresponding values *in vacuo*. The inclusion of various physical constants, and of data for the computation of volumetric capacity from apparent weight of water-content, increases the usefulness of the compilation. A similar production adapted to British requirements might with advantage be made available for use in this country.

WE have received Technologic Paper No. 76 of the Bureau of Standards, U.S. Department of Commerce. It contains an account of experiments made upon the determination of the proportion of volatile "thinning" or diluent substances present in oil varnishes.

THE trajectory of a body falling freely *in vacuo* forms the subject of a paper by M. A. Viljev in the *Bul. Acad. Sci.*, Petrograd (May, 1916, pp. 643–671). After referring to the work of previous investigators he sums up the results of his own researches thus: 1. In dealing with this problem some authors have used inaccurate equations of motion, while others have not correctly defined the position of the vertical line. 2. A distinction must be made between the vertical line and the plane of the prime vertical at the upper point of the trajectory, corresponding to the initial position of the falling body, and the vertical line and plane of the prime vertical at the lower point of the trajectory, where the fall of the body ceases. At each point the vertical line is defined as passing through the initial position of the body perpendicular to the surface of the equipotential of the full force of gravity, produced through the given point. The plane of the meridian passes through the axis of the earth's rotation and the initial position of the body. The plane of the prime vertical passes through the vertical line as above defined and is perpendicular to the plane of the meridian. 3. On the basis of these definitions it is found that the body swerves from the plane of the prime vertical of the upper point of the trajectory slightly towards the pole. Relatively to the plane of the prime vertical of the lower point of the trajectory it swerves more towards the equator. 4. In falling in a shaft it swerves from the plane of the prime vertical of the upper point of the trajectory towards the equator. Also relatively to the plane of the prime vertical of the lower point of the trajectory it swerves towards the equator.

THE Royal Worcester Porcelain Company, Ltd., has sent us some specimens of its porcelain dishes and crucibles for chemical use. As is well known, before the war our chemical laboratories were entirely dependent on material of German origin. This Worcester porcelain has been examined by the National Physical Laboratory, which reports that in regard to all the qualities which can be examined in a short-period test the Royal Worcester laboratory ware is as good as the best laboratory ware hitherto employed, of which the Royal Berlin ware is a typical example. Details are given of the tests, which included the effect of strong sulphuric acid, and 10 per cent. solutions of caustic soda and sodium carbonate, the behaviour of the glaze at high temperatures, the constancy of weight of the dishes, and the resistance to sudden changes of temperature. As regards crucibles, thanks to the purely British industry in fused silica ware, we are almost independent of the quality of porcelain, but for basins porcelain is still essential. For these it is a vital point that material used in one experiment shall not be in part retained by the glaze and carried on to the next, and the National Physical Laboratory report would carry more conviction if greater attention had been paid to this matter. There was a slight *gain* in weight after the treatment with sulphuric acid, and on this the remark is made: "It has not been considered necessary to ascertain whether the increase in weight is due to combination between the sulphuric acid and the material of the glaze or to a slight penetration of the acid in the ware below the glaze." Time would have been better spent in developing this point than in high-temperature experiments, which, for dishes, were superfluous. The ware is made very much thinner than has been customary, and consequently is unduly fragile. In spite of careful packing two of the specimens arrived broken. It is very desirable that we should be independent of foreign supplies of porcelain, and it is to be hoped that the enterprise of the Royal Worcester Porcelain Company and other British porcelain manufacturers will be rewarded, but prolonged use in the laboratory is the only certain means of proving the qualities of the new ware.

Messrs. Williams and Norgate announce "Raphael Meldola: Reminiscences by those who knew him," with a preface by Lord Moulton and a chronological list of Prof. Meldola's publications. The work will be divided as follows:—Biographical memoir; early years; professor of chemistry; chemical investigator; naturalist; astronomer; personality.

OUR ASTRONOMICAL COLUMN.

The Solar Physics Observatory.—The report of the director of the Solar Physics Observatory for the year ending March 31, 1916, has recently been issued, this being the third annual report since the transference of the observatory from South Kensington to Cambridge. The work of the observatory has been carried on with difficulty on account of the war, two members of the staff now being absent on military service and two on munition work. Observational work with the Newall telescope and the Huggins instruments was not attempted, but the spectroheliograph was in regular use, photographs of the sun's disc in K_{2-3-2} light having been obtained on 112 days, and of prominences at the limb on 93 days. Sun-spot spectra in the region λ 5300 to λ 5500 were also successfully photographed with the McClean installation. Mr. Baxandall has made considerable progress in the assignment of chemical origins of lines in stellar spectra, and in a revision of the origins given by Rowland for lines in the solar spectrum. The great majority of Rowland's identifications have been confirmed, and terrestrial equivalents for many lines not identified by Rowland have been found by reference to data subsequently published. Experimental work has established the identity of the G group of the solar spectrum with the hydrocarbon band λ 4314 (see Nature, July 20), and it is thought that a clue has been obtained to the interpretation, in terms of carbon, of the remarkable spectrum of Comet Wells, 1882. In the department of meteorological physics, Mr. C. T. R. Wilson has continued the study of lightning discharges.

With regard to the "Annals of the Solar Physics Observatory," of which vol. iii., part 1, has already been distributed, it is now explained that vol. i. is intended to contain historical and descriptive matter, vol. ii. to refer to stellar investigations, and vol. iii. to deal with work on the sun.

Relative Luminosities of Sun and Stars.—A convenient formula for comparing the luminosity of a star with that of the sun has been given by Mr. C. T. Whitmell (*L'Astronomie,* August, 1916). Assuming the stellar magnitude of the sun to be $-26{\cdot}5$, and designating the luminosity, parallax, and magnitude of the star by L, *p*, and *m,* the luminosity of the star in terms of that of the sun is given by the equation:

$$\log L = 0{\cdot}0289 - 2 \log p - 0{\cdot}4\ m.$$

In the case of Sirius, for example, where $p = 0{\cdot}38''$ and $m = -1{\cdot}6$, $\log L = 1{\cdot}5093$ and $L = 32{\cdot}3$, showing that Sirius is about 32 times as bright as our sun. The constant term in the equation depends upon the value assigned to the sun's stellar magnitude, and is equal to $10{\cdot}6289 + 0{\cdot}4(S)$, where S is the adopted value.

The Thermopile in Photographic Photometry.—The usual method of arriving at the magnitudes of stars shown on photographs is to measure the diameters of the stellar images, or to determine the opacity of images purposely taken out of focus. In either case the result depends in part on the judgment of the observer, and the application of some purely physical method is evidently desirable. Such a method has been devised by Mr. H. T. Stetson, of the Yerkes Observatory, in which the star image is surrounded by a small circular diaphragm, and the intensity of the transmitted beam from a steady source of light, as compared with that of the unrestricted beam, is measured by means of a thermopile and galvanometer. Theory leads to the expectation of a fourth-root relation between galvanometer deflections and stellar magnitudes, and this has been confirmed experimentally. The device appears to have reached a convenient practical form, and measurements of a plate of the Pleiades, for example, indicated a probable error of 0·022 mag. for a single star. An extensive application of the method to the eclipsing variable U Cephei has been commenced, and variations not explained by the eclipse theory have been detected. When provided with a stage having a micrometer screw, and the circular aperture being replaced by a slit, the apparatus becomes well adapted for certain investigations of spectra. In this form it seems likely to be especially useful in the study of colour index, and may possibly aid in the determination of radial velocities of faint stars from objective prism plates taken through a neodymium absorption cell (*Astrophysical Journal,* vol. xliii., pp. 253 and 325).

RECENT INDIAN MUSEUM PUBLICATIONS.

THE latest serial publications of the Indian Museum reach a very high level of excellence. Vol. v., No. 3, of the Memoirs consists of Mr. Stanley Kemp's report on the Decapod crustacea of the Chilka Lake, an area where the density of the water ranges according to season between freshness and a saltness equal to that of the sea. The species, which number 54, include crabs, hermit-crabs, Thalassinids, Caridea, and Peneids. Among the permanent inhabitants, or species capable of withstanding every seasonal change in the water, from fresh to salt, it is surprising to find such characteristically marine forms as Leucosiid and Xanthid crabs, Alpheidæ, and the pelagic Lucifer. The permanent inhabitants constitute 72 per cent. of the whole. The seasonal immigrants (about 7·5 of the whole) all appear, whether normally marine or fresh-water species, to breed in the lake. The casual visitors (about 20 per cent.) are almost all from the sea. Among the 12 species described as new is *Athanas polymorphus,* the males of which are trimorphic. The report is a model of clear and critical exposition, being rich in inference and illustration, but always concise and explicit.

No. 1 of vol. vi. of the Memoirs contains two important papers, one on Indian Tunicata by Dr. Asajiro Oka, the other by Colonel J. Stephenson on Oriental earthworms. The first deals with simple Ascidians and pelagic forms, and does not go much outside the collections made by the *Investigator.* Perhaps the most interesting item is a full descrip-